

# Whitewater Canal State Historic Site

## *A Journey into the Past*

**Lesson Plan for Grades 6 - 8  
Text and Activities**

**Whitewater Canal State Historic Site**  
19083 Clayborn St. · Metamora, In 47030 · (765) 674-2734 · [wwcshs@cnz.com](mailto:wwcshs@cnz.com)  
*Part of Division Indiana State Museum and Historic Sites*

# *Whitewater Canal State Historic Site*

## *A Journey into the Past*

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*The early 19<sup>th</sup> century was an exciting time to be living in Metamora. With the passing of the Mammoth Internal Improvement Act of 1836 came the funds to build a canal through the Whitewater Valley. The canal was a way for people to ship merchandise as well as travel between towns. Through the use of a waterwheel, the canal was also a source of power for many mills, such as the Metamora Grist Mill. Step back in time and experience the past as seen through the Whitewater Canal and Metamora Grist Mill.*

### **Contents:**

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- ❖ Whitewater Canal State Historic Site Multiple Choice

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## Vocabulary List

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*Aqueduct* – one body of water going over another body of water.

*Canal* – an artificial waterway.

*Commerce* – an interchange of goods among people in one area.

*Dam* – a barrier to control the flow of water.

*Freight Boat* – a boat designed to transport goods.

*Grain* – a small, hard seed of any food plant.

*Grist* – grain to be ground.

*Mammoth Internal Improvement Act of 1836* – this act enabled the state legislature to borrow \$10 million from the federal government to build roads, canals and railroads throughout Indiana, including the Whitewater Canal.

*Lock* – a chamber in a canal or dam for raising or lowering vessels by admitting or releasing water.

*Meal* – a coarse powder ground from the edible seeds of grain.

*Miller* – a person who owns or operates a mill.

*Packet* – a boat that carries light cargo and passengers regularly on a fixed route.

*Stagecoach* – a horse-drawn carriage traveling over a regular route.

*Waterwheel* – a wheel turned by the action of moving water and used to provide power.

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# *The Whitewater Canal State Historic Site*

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## *History of the Whitewater Canal*

### **The Beginning**

The Whitewater Valley stretches along the eastern part of Indiana, beginning today near U.S. 40 and extending southward. The people of early 1800 living in this area needed to create an outlet to the outside world. This area was not located near any major cities, making it difficult to receive goods and services. To solve this problem, it was decided to build a canal connecting the Whitewater Valley to outlets of the Ohio River. That connection made it possible for residents of the valley to travel, transport, and receive goods and services previously not available to them.

The Indiana General Assembly passed the **Mammoth Internal Improvement Act of 1836** (Noah Noble was the Governor of the state at this time). This act was designed to improve transportation and develop **commerce** throughout the state. The building of the canal was made possible to the passing of this act.

### ***Did You Know?***

Before the building of canals, transportation was mostly done by **stagecoach** over very rough roads and trails.

### **Canal Construction**

The canal was originally designed to extend 68 miles, running from Cambridge City in the north to Lawrenceburg in the south. A large ground breaking celebration was held to dedicate the new canal in September 1836. Once the celebration was done, the hard labor began. Using tools like picks, shovels, and mules, the canal was hand-dug by Irish immigrants from around the country. The canal cost roughly \$15,000 per mile and took 10 years to build. One reason the canal took so long to build was because it ended up being 101 miles long overall, instead of the original 68 miles. Eight miles were added on the northern end to extend the canal from Cambridge City to Hagerstown and 25 miles were added at the south to extend to Cincinnati, Ohio (this portion was built by the state of Ohio). The Cincinnati connection proved to be very important and opened the large market of a big city to the small rural area of the Whitewater Valley. The second reason it took so long to build the canal was due to the number of **locks** and **dams** that had to be built. Overall, the canal had 56 locks and 7 dams to accommodate an elevation drop of 491 feet from the north to the south. These additions also cost money, bringing the total construction cost to \$1,164,655.

### ***Did You Know?***

A normal canal construction unit consisted of 31 engineers, 1 secretary, 24 rodmen, 20 axemen and 975 laborers.

## Canal Boats

There were two kinds of boats used on the canal: **packets** were used for passengers and light cargo and **freight boats** were mainly used for cargo hauling. The freight boats were very useful for hauling cargo such as building stones, lumber, **grain**, flour, salt, lard, livestock, poultry, produce, whiskey, and tobacco. Canal boats were only allowed to go as fast as four miles per mile, however boat captains rarely abided by that law. Captains were even known to have fights over who would enter the lock first. The first boat to travel on the canal was the *Ben Franklin*, traveling from Lawrenceburg to Brookeville in 1839.

## Did You Know?

If passengers rode the entire length of the canal for \$3.00 and the trip would take roughly one week.

## *The Metamora Grist Mill*

### The Development

Jonathan Banes, a former engineer and participant in the digging of the Whitewater Canal, built the Metamora **Grist** Mill in 1845. It began as a cotton mill, but since cotton was not grown in the Whitewater Valley, the mill was not very profitable. He later transformed the mill into a gristmill to grind corn and wheat, crops that are grown in Indiana. The original mill was a three-story frame structure built of wood, but burned down in 1899 and was rebuilt the following year and converted to the brick mill still standing today.

### A Mill's Operations

The **waterwheel** behind the mill provides the power to operate it. The mill is located next to one of the original locks of the Whitewater Canal. In 1973, a new type of wheel was installed to aid milling operations. It is a breast wheel that turns by the amount of water flowing through a canal lock. It catches the flow of the water about midway up the wheel. The force generated by the mill is transmitted through gears and pulleys from the basement of the mill to the machines on the first floor. The mill grinds hard winter wheat into flour and both white and yellow corn into corn meal and grits. The wheat is ground into flour between two stones that are 24 inches in diameter and arranged upright. The corn is also ground by stones and then sifted by consistency to produce corn meal, grits and feed for the site's ducks and canal boat horses.

## Did You Know?

The Metamora Grist Mill wheel revolves about 18 times per minute and generates approximately 50 horsepower units.

### The Importance of Mills

Mills and **millers** were very important for life in small towns during the middle to late 19<sup>th</sup> century. In 1860, there were over 700 operating grain mills in Indiana. Mills were so important that the location of a mill often determined the site of a town. Farmers might exchange news with each other while waiting for their grain to be ground. Many mills, such as the Metamora Grist Mill, were located on rivers and streams using water sources to provide power. Roads were often built directly to mills because they were

responsible for grinding grain, setting prices, buying, selling, and serving all the area farmers.

### ***Did You Know?***

There are now only a few operating mills in Indiana.

### **The End of the Canal Era**

Despite the promise of the Whitewater Canal, there were some problems. Within two years after the canal was finished, there were three floods that washed dams, **aqueducts**, and canal banks away. More money had to be spent to repair these damages. With the introduction of railroads to Indiana, Hoosiers began craving for a cheaper and faster alternative to canal. This new form of transport quickly led to the end of the canal system. No one wanted to travel four miles per hour on a canal when they could travel 25 miles per hour on a train. Trains could also transport more cargo compared to that of small canal boats. Because of this shift in transportation, the canal never paid for itself and, in turn, the state lost much of its money of the canal's construction.

Though the canal brought problems to the state, it also had some positives. Through the Mammoth Internal Improvement Act in 1836, Indiana embarked on various projects designed to leave behind the isolation of pioneer life, on a path of progress that connected its people and products to the rest of the nation and the world. The Whitewater Canal and other canals statewide provided greatly for agricultural expansion and the export of surpluses, importation of eastern merchandise, and for greater economic diversification towards commerce and manufacturing. This led ultimately to the development of business expansion, giving rise to new communities and urban growth. Unequivocally, the impact generated by the development of the canal is reflected yet today by the remnants of that noble undertaking in yesteryear, perhaps best reflected by Indiana's distinction as the "Crossroads of America."

The canal era was an important and lively period in both the state of Indiana and in the United States. The canals were desperately needed at the time, but no one foresaw the rapid development of the railroad. In 1946, the State of Indiana and the Department of Natural Resources began restoring the 14 miles of the original Whitewater canal. This section extends seven miles north and seven miles south from Metamora with water supplied by one of the original canal dams.

### ***Did You Know?***

The State of Indiana went bankrupt in 1840 causing the canal to be completed by private enterprise.

### ***The Whitewater Canal Today***

#### **The Ben Franklin III Canal Boat**

Today, visitors can ride the *Ben Franklin III*, named after the first boat on the Whitewater Canal. It is designed to look like the old canal passenger boats, except it has a roof; old canal boats did not have a roof. The *Ben Franklin III* travels the same way the canal boats traveled in the 1840s and 1850s, with two horses pulling it. The canal is 26 feet wide at the bottom, 40 feet wide at the top and four feet deep. The towpath for horses is

10 feet wide. The horses walk along the path next to the canal and pull the boat along behind them. These are not speedboats, sailboats, or rowboats, but are flatboats designed for easy transportation for both passengers and cargo. Horses would often only travel from one town to the next and a boat got new horses at each town to eliminate stress placed on the animals.

***Did You Know?***

The *Ben Franklin III* weighs 10.5 tons and is 75 long.

**The Duck Creek Aqueduct**

The *Ben Franklin III* travels through the Duck Creek Aqueduct. An aqueduct is a body of water going over another body of water. The Duck Creek Aqueduct is a covered bridge that carries the canal 16 feet over Duck Creek. It is believed to be the only wooden aqueduct still operating in the United States. The original structure was built in 1843 but destroyed by a flood in 1846. Shortly after that, it was reconstructed using a covered bridge from the area.

***Did You Know?***

The inner beams are from the original bridge and are made of poplar.

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## 6<sup>th</sup> – 8<sup>th</sup> Grade Activities

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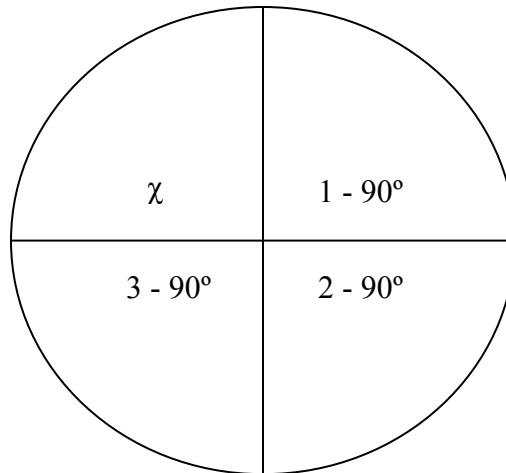
The visit to the *Whitewater Canal State Historic Site* and the use of this packet will, in part, fulfill the following requirements from the Indiana Academic Standards:

**Math:** 6.1; 6.2; 6.4; 6.5; 6.6; 7.2; 7.5; 8.2; 8.4; 8.5

**Science:** 6.1.7; 6.1.9; 6.3.20; 7.1.9; 7.1.10; 7.2.1; 7.2.7; 8.1.8; 8.2.8

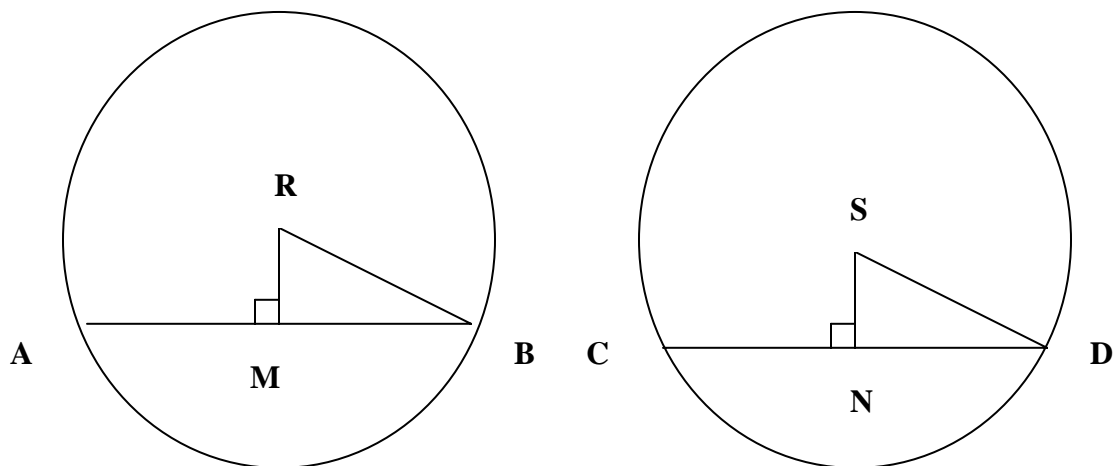
### MATH ACTIVITIES

1. A miller decides that he will take 10% of the grain he grinds as payment for his work. One farmer brought 20 pounds of grain to grind. Another farmer brought 80 pounds of grain to grind. A third farmer brought 5 pounds of grain to grind. How many pounds of grain did the miller get to keep as payment?
2. The following is a list of how many riders a canal boat had each day in one week. (10, 35, 45, 60, 45, 45, 19) Find the mean, median, and mode of these numbers.
3. Using the diagram representing the mill's waterwheel to determine what angles are vertical angles, adjacent angles, and supplementary angles. Determine what the degree of the unknown angle is by using the remaining angle.



4. Originally, the Whitewater Canal extended 101 miles. How many kilometers did the canal run (Note: 1 mile = 1.609 kilometers)?
5. To ride the canal, it cost one person \$3.00. If the *Ben Franklin* had 180 passengers in the course of one week, how much money was made? If the ticket cost doubled, then how much would be made?

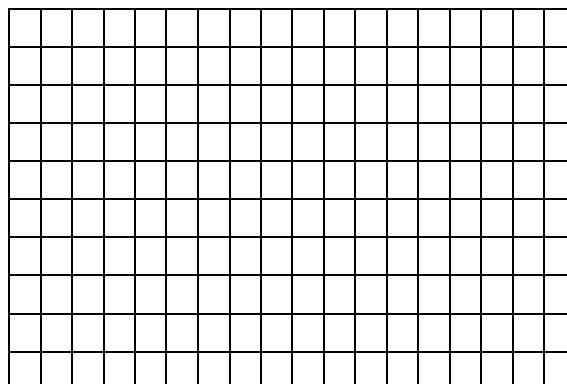
6. Today, the mill sells corn and wheat flour in 2 lb. bags. If the mill sold 1,256 bags of flour in 6 months, how many pounds does that equal to? Using that total, figure how many kilograms the miller sold. (1 lb. = 0.454 kg.)
7. The Whitewater Canal's boat, the *Ben Franklin III* is 9 feet high and 75 feet long. A model of the same boat is 25 inches long. How long is the model?
8. A) If a canal boat's speed is 4 miles per hour and it traveled for 6.5 hours, how many miles did it travel? B) On the same trip home, the captain decided to break the law and travel at 8 miles per hour. How long did the trip home take? C) What are the difference the two lengths of time in hours and minutes?
9. If 50 gallons of water are able to make the waterwheel at the mill turn 20 times per minute. If the mill was run six hours a day for five days straight, how many gallons of water would be used to make the wheel turn? How many cups of water would that gallon amount be (1 gallon = 16 cups)?
10. Take a look at the two circles below, representing two separate water wheels. Find what line *CD* is if *Circle R* is congruent to *Circle S* and line *AB* = 8.



## SCIENCE ACTIVITIES

1. The Metamora Gristmill gets its power from the canal, which turns the waterwheel, setting the gears of the mill in motion. Have students go to library or media center and research the different kinds of energy that power large manufacturing plants. Next, they should write an essay to address the following questions: What forms of energy are easily transported? Are there dangerous forms of energy? How do other forms of energy compare with the water energy that powers the mill? Are the advancements in energy good for manufacturing? Are they good for neighborhoods and people?
2. The miller has to move a wheelbarrow full of milling remains to the horses in the stables. The remains in the wheelbarrow weigh more than the miller, yet the miller can move the wheelbarrow without difficulty. Why is this?
  - a. The handles of the wheelbarrow spread the weight out over a larger area.
  - b. Lifting the handles puts the most of the weight onto the wheelbarrow's wheel.
  - c. Putting the flour up into the wheelbarrow decreases the force of gravity of the flour.
  - d. How air from the ground pushes up against the wheelbarrow and carries some of the load.
3. The mill works with the help of water turning a waterwheel, which is connected to the mill machinery by a shaft running under the mill. Let's say it takes 50 gallons of water a second to turn the waterwheel. What do you predict would happen if the volume of water were changed to 25 gallons of water? What do you predict would happen if the shaft were disconnected?
4. The same baker went to the mill once each week for three weeks straight. The first week, he bought 15 lbs. of corn meal. On the second week, he bought 23 lbs. of corn meal. And on the third week he only bought 8 lbs. of flour. Overall, how many lbs. of flour did the baker buy? How many grams does that equal to? (1 lb. = 453.6 grams)
5. Use the chart below to answer the following questions. What is the amount of flour the miller made on this day? If flour is sold in 2-pound bags, how many bags of flour were produced? What is the average amount flour the miller produced in one hour? Use the information above to create a bar graph on the grid below.

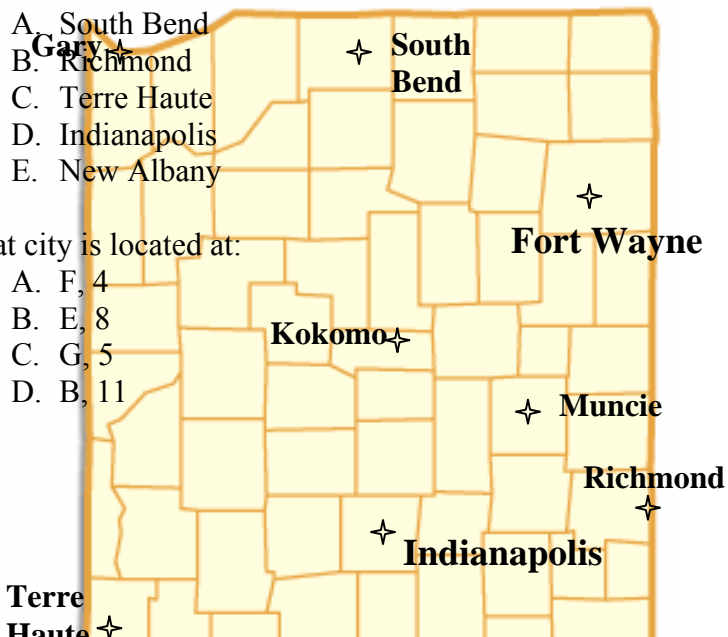
Hour of Production	Amount made in 1 hour
Hour 1	5 lbs.
Hour 2	6 lbs.
Hour 3	2 lbs.
Hour 4	7 lbs.
Hour 5	6 lbs.
Hour 6	3 lbs.



[illegible]

A. South Bend  
B. Gary  
C. Terre Haute  
D. Indianapolis  
E. New Albany

A. F, 4  
B. E, 8  
C. G, 5  
D. B, 11



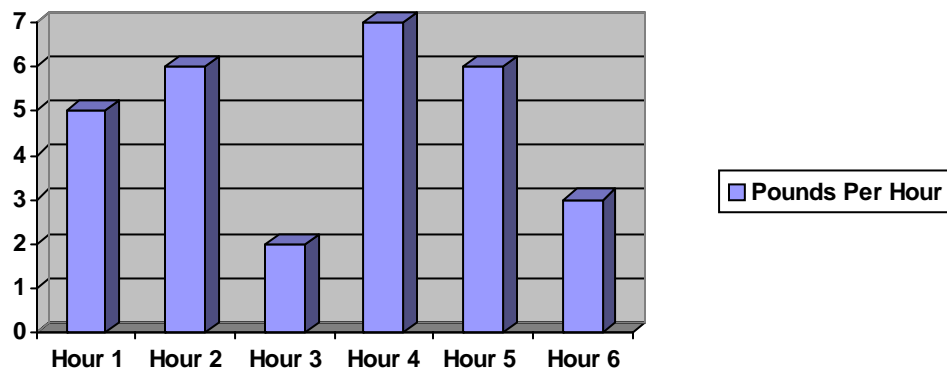
## **ANSWER KEY**

### **Math Answers**

1. 10.5 pounds
2. mean = 37  
median = 35  
mode = 45
3. Angles 1 & 3 and Angles 2 &  $\chi$  are vertical angles.  
Angles 1 & 2, Angles 2 & 3, Angles 3 &  $\chi$ , and Angles  $\chi$  & 1  
are both adjacent and supplementary angles.
4. 162.509 km
5. \$540.00  
\$1,080.00
6. 2,512 lbs. or 1,140.448 kgs.
7. 3 inches high
8. 29 lbs. were made  
14.5 2-pound bags  
Around 5 bags per hour
9. a) 26 miles  
b) 3.25 hours  
c) 3 hours 15 minutes
10. 90,000 gallons of water  
1,440,000 cups of water
11.  $CD = 8$ ,  $CD$  is congruent to  $AB$

### Science Answers

1. Answers depend on student's research.
2. B
3. The rate the miller can produce flour through machinery will decrease. The miller will be unable to make flour if the shaft was disconnected.
4. 46 lbs.  
20,865.6 grams
5. 29 lbs. were made  
14.5 2-pound bags  
Around 5 bags per hour



6. a) E1  
b) F6  
c) C7  
d) E6  
e) F10
7. a) Kokomo  
b) Bloomington  
c) Muncie  
d) Evansville